TRIGONOMETRY (Q 4 & 5, PAPER 2)

2011

4. **(a)** Evaluate $\lim_{x\to\infty}\left(\frac{\sin 2x+\sin x}{3x}\right)$.

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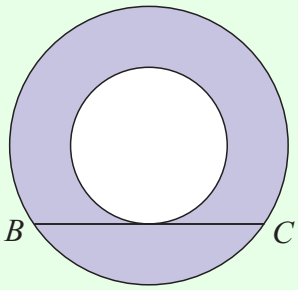
(b) Find all the solutions of the equation

$$\sin 2x+\cos x=0, \text{ where } 0^\circ \le x \le 360^\circ.$$

(c) The diagram shows two concentric circles.
A tangent to the inner circle cuts the outer circle at B and C, where $|BC| = 2x$.



(i) Express the area of the shaded region in terms of x.

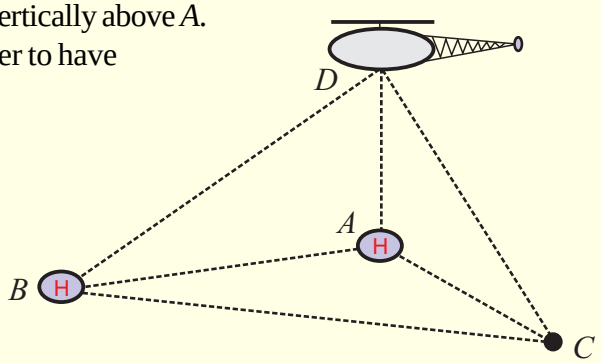
(ii) In the case where the radius of the outer circle is $2x$, show that the portion of the shaded region that lies below BC has area $\left(\frac{2\pi}{3}-\sqrt{3}\right)x^2$.

5. **(a)** Find the values of x for which $3\tan x=\sqrt{3}$, where $0^\circ \le x \le 360^\circ$.

(b) **(i)** Prove that $\tan(A+B)=\frac{\tan A+\tan B}{1-\tan A\tan B}$.

(ii) Show that if $\alpha+\beta=90^\circ$, then $\frac{\tan 2\alpha}{\tan 2\beta}=-1$.

(c) A and B are two helicopter landing pads on level ground. C is another point on the same level ground. $|BC| = 800$ metres, $|AC| = 900$ metres, and $|\angle BCA| = 60^\circ$.
A helicopter at point D is hovering vertically above A.
A person at C observes the helicopter to have an angle of elevation of 30°.



(i) Find $|AD|$, in surd form.

(ii) Find $|BD|$.

ANSWERS

4 (a) 1

(b) 90^o, 210^o, 270^o, 330^o

(c) (i) πx^2

5 (a) 30^o, 210^o

(c) (i) $300\sqrt{3}$ m (ii) 1,000 m